Space Weather Forecast

Issued on Tuesday, 21 March 2023 at 01:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of M-class flares. G1-G2 Minor/Moderate storms likely day 3 (23rd).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with one Moderate flare observed from the largest sunspot in the southeast disc. This is a wide region, with a large leader spot but a declining trailer spot. The most complex region on the disc is also in the southeast. This is comprised of two same-polarity spots connected together, but has also seen some complexity develop with a reverse polarity region forming ahead of the northernmost of these. There are a total of seven sunspot regions currently on the disc, however the other regions are generally small and simpler, although a number of these are showing signs of growth.

The Earth-facing disc also has a number of filaments (arcs of material held together by the Sun's magnetic field) across it, and one of these was observed erupting in the northeast disc around 20/1300 UTC. This resulted in a coronal mass ejection (CME) which has been analysed as likely glancing Earth on the 23rd. Further similar events are possible. A second, potentially Earth-directed CME was observed leaving the southwest disc early on the 20th. The source of this was likely a reconfiguration of the Sun's magnetic field, leading to some material being released. Analysis has yet to be completed on this CME.

Solar Wind / Geomagnetic Activity: The solar wind speed was initially slightly elevated at around 400-450 km/s, but saw an increase to around 480 km/s at 20/1000 UTC, then continued ranging 400-480 km/s thereafter. This was likely the glancing arrival of the anticipated CME from the 17th, The magnetic field strength remained weak however, at around 5-8nT for much of the day, although since this evening, this has gradually climbed to be Moderate. The north-south component has been variable and mostly weak. Geomagnetic activity was Quiet to Active (Kp 0-4), with the strongest activity 20/1500-1800 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remains just above background levels after the S1/Minor Solar Radiation Storm that occurred last week, however this is still well below the S1/Minor Storm level.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is most likely, but with a chance of increasing to Moderate at times with isolated Moderate-flares. These most likely from the regions currently on the southeast disc, or from other regions rotating over the eastern limb over the coming days.

Solar Wind / Geomagnetic Activity: A CME from the northeast filament eruption on the 20th is expected to give a glancing arrival around 23/1500 UTC. A further CME from the 20th has yet to be analysed. Fast winds from a small coronal hole are expected to give a modest enhancement on day 1 (21st). A further, larger and stronger coronal hole is then expected to give an enhancement later day 2 or day 3 (22nd or 23rd). Quiet geomagnetic activity, with Unsettled intervals, is expected to become Unsettled for a time with a chance of Active intervals day 1 (21st). Activity also increasing day 2 and during day 3, with Active to G1 Minor storm intervals likely due to the coronal hole and CME influence. Unsettled to Active conditions likely follow day

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4 (24th) with an ongoing chance of G1 Minor Storm intervals.

Energetic Particles / Solar Radiation: The count rate of energetic particles is expected to continue very gradually and erratically declining towards background with only a very slight chance of further enhancements given any significant flares occur.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	30	60	40
Strong	G3	No	1	1	5	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	40	40	40
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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